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ABSTRACT

Advances in environmental education by professional and science-oriented organizations are enumerated in this newsletter. An effort is made to describe the work being done by large and representative groups whose headquarters are not located in the Nation's capital and whose principle concerns include curriculum planning and preparation of teachers for directing environmental studies. Summaries of program objectives, activities, and materials of large scale environment-oriented programs are provided for: (1) Anthropology Curriculum Project, University of Georgia, Athens; (2) Biological Sciences Curriculum Study (BSCS), University of Colorado, Boulder; (3) Environmental Studies Project, American Geological Institute; (4) Intermediate Science Curriculum Study (ISCS), Florida State University, Tallahassee; (5) Science Curriculum Improvement Study (SCIS), University of California, Berkeley; and (6) Institute for Environmental Education, Cleveland, Ohio. Several local level programs are also reviewed. In addition, the Group for Environmental Education project, Philadelphia, Pennsylvania is portrayed as it relates to the social studies field. (BL)

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Vol. 1, No. 3 September 1971

Environmental Education Momentum Increases

A major interest of *Science for Society—Education Review* is in presenting to its readers a broad picture of advances on the environmental education front. In the immediately preceding issue activities of this nature carried on by Washington-based professional organizations and government agencies were sketched. In this issue effort is made to describe work being done by large and representative groups whose headquarters are elsewhere than in the Nation's capital and whose principal concerns include curriculum planning and preparation of teachers for directing environmental studies. Through reference to these two issues, people with a special interest in this fast-growing phase of American education should gain a reasonably comprehensive, up-to-date understanding of what has been done so far and what the future holds.

Anthropology Curriculum Project

Man is an animal, and therefore is part of the ecological balance of a determinant environment. Unlike other animals, however, man does not merely adjust to his environment, but through supraorganic adaptations called culture interacts to change and create new ecological balances.

Man thus not only changes the external appearance of his natural environment, the landscape, but creates new environments with new ecological balances. These range in complexity proportionate to his technological capacity and mastery over inanimate energy, giving the illusion of environmental control. But whether in utilization of fossil fuels, development of advanced disease control techniques, or mastery of space exploration, the technology of man is exercised in accordance with, and not in opposition to, natural law. Man in culture remains a prisoner of the planet on which he emerged as *Homo sapiens*. The physical existence of man, even in an atomic age, remains dependent on the solar energy which plants capture through photosynthesis.

In the industrial, urban phase of man's development, environmentalists have become increasingly concerned about the extent to which industrial man may destroy the ecological balances on which planetary existence depends. Since industrial man utilizes the resources from the seas and lands of all the world, a world ecological view must replace an attitude of regional ecology. But the current popular interpretation that industrial man is alone responsible for new ecological systems is not consistent with an anthropological approach to history and the environment.

Even before man ceased to be a hunter and forager, the cultural preferences he developed for meat and plants profoundly affected the ecological balance of the territory he inhabited. The most dramatic ecological changes were initiated when man domesticated plants and animals. His systematic control of food production drastically altered the animal-plant balance. Man was destined to become the dominant animal, not merely in rational use of the environment but in numbers. Eventually the growth in human population became so great that it inspired Malthus to write his gloomy predictions, predictions which hitherto had been belied by the technological capacity of man to increase his food supply.

An anthropological view today rejects the Malthus thesis. It suggests that since man can interact with nature, he has the capacity to make the necessary adjustments to preserve the world environment to sustain even larger populations. Recycling of water is but one example of the way in which man can apply technology to solve environmental problems which he creates.

An anthropological view of ecology naturally places man at the center of interaction with the other natural forces which influence the environment. To exclude man is to imagine an unreal ecology which has not existed since protohumans first used a stick intentionally as a tool.

The Anthropology Curriculum Project is one of the early national curriculum projects funded by the U.S. Office of Education. Since 1969, it has been financed by the College of Education, University of Georgia. With completion of the current units on cultural change next fall, the Project will offer units in anthropology for Grades K-9, and one high school unit, *Race, Caste, and Prejudice*.

The Project's original objective was to develop units in anthropology, presented as a systematic science, for

use in the elementary grades. Since that time, the number of grades included has been extended and considerations given to affective as well as cognitive development. Units developed include such topics as culture, rise of old world culture, cultural change, archaeological methodology, evolution, fossil man, language, life cycle, and political anthropology. A cross-cultural approach has been used involving ethnologies from different parts of the world. In addition to cross-cultural studies of preliterate peoples, the project has also looked at man in the modern setting, such as industrialization and modernization in Japan and Mexico, nationalism in Africa, and planned agricultural change in India. Throughout most units the culture of the United States has been used as a reference point. The project also emphasizes the scientific methods by which the anthropologist acquires and disseminates information. An example is the kindergarten unit, capitalizing on teacher use of show-and-tell, which introduces students to the systematic study of human behavior through observer and interview techniques.

In addition to development of material, the Project has been concerned with curriculum research using whole-class groups and different methodologies of instruction. Two tutor texts, "Archeological Methodology" and "Evolution," have been developed. Descriptive materials, research results and price lists are available. Sample sets and classroom sets of material may be purchased. Write: Marion J. Rice, Director, Anthropology Curriculum Project, Dudley Hall, University of Georgia, Athens, Georgia 30601.

The Biological Sciences Curriculum Study (BSCS)

The Biological Sciences Curriculum Study has engaged in a number of new programs concerning the problems of science and society, with different programs designed for teachers, for students, and for laymen. The programs, centered in the exploration of contemporary human problems, are designed to relate the sciences to these problems.

A partially completed module for instruction in the biological sciences, *Investigating Your Environment*, has been developed with a grant from the Division of Comprehensive and Vocational Education, Bureau of Research, U.S. Office of Education. This module, planned for from four to six weeks of instruction at the high-school level, abandons several standard components of science curriculum materials. Rather than being presented with laboratory exercises, the student is provided with a series of techniques for gathering information about the quality of the environment in his community. The formulation of significant problems to investigate, the design of investigations, the analysis of data and interpretation of the data are left to the student. The teacher's handbook provides for continuity of instruction since a textbook is not a part of the materials. Carefully selected papers from journals and books present a variety of ideas and suggestions that extend the investigation beyond the community to national and global proportions. These papers have been selected, but have not been rewritten for student use.

In 1969, BSCS was funded under a grant from the U.S. Office of Education, Bureau of the Handicapped, to develop model life sciences materials for educable mentally handicapped students, ages 11 through 19.

Recognition by the national community of the need for special emphasis upon matters of ecological concern led the BSCS staff to decide early that a portion of its materials for EMH students should focus on environmental studies. Funding for the development, over a three-year period, of a two-year curriculum in environmental studies for 13- to 15-year-old EMH children was granted by USOE, Bureau of the Handicapped, in June, 1971.

In May, 1971, a planning conference to develop guidelines for this curriculum, "Me and My Environment," was attended by the BSCS project staff, the advisory committee consisting of four special educators and one biologist, and by the project writing team consisting of five special education and five biology teachers. A multidimensional model incorporating the science content, cognitive and affective behaviors, ecological themes, contextual focus, and needs of the children resulted from the conference. The BSCS project staff then drafted a content and objective outline for the curriculum after a thorough study of the physical, social, and psychological needs of adult retardates as described by a study conducted by the Department of Special Education at Yeshiva University, New York.

An eight-week writing conference, initiated June 28, 1971, developed materials for field trials to be conducted November 1971 through June 1972. A second writing conference to revise the materials for large-scale field testing and evaluation during 1972-73 will be held next summer, with final revision for commercial publication scheduled during the summer of 1973.

The present content outline calls for three units in the two-year curriculum. The first will be introductory, featuring activities of an exploratory nature to assist the student in communicating about his environment, to stimulate his interest in exploring it, and to help him relate various environmental components to his needs, problems, and interests. In unit two, the student will explore how the environment meets his needs for food, air, water, shelter. In unit three, the student will explore societal needs, population dynamics, and utilization of space. Ecological themes to be interwoven throughout include interrelationships of environmental components, complimentarity of organisms and environment, finiteness of resources, flow of energy, cyclic nature of processes, and population dynamics.

As reported previously in *Science for Society—Education Review*, BSCS has produced two provocative films, "The Tragedy of the Commons" and "An Interview with Garrett Hardin" that seek to stimulate

discussion of a wide range of environmental issues. It also has sponsored the publication, through Bobbs-Merrill Company, of a series of books for citizens whose formal education does not extend beyond high school. Three volumes in the series are now available. *The Personal Meaning of Birth Control* by Garrett Hardin; *Symbiosis* by Thomas C. Cheng and *Birth Defects* by E. Peter Volpe.

In June of this year, the 15 teacher pairs (biology and social science) which first conferred in the summer of 1970 on issues involving both fields, returned to Boulder to discuss their experiences in developing cooperative instructional materials. They also worked on development of guidelines for science and social science teachers interested in cooperating in similar fashion.—James T. Robinson, Consultant, Biological Sciences Curriculum Study, University of Colorado, P. O. Box 930, Boulder, Colorado 80302.

Environmental Studies—Geology

A new NSF grant of $327,100 to the American Geological Institute provides for continuance of the Environmental Studies Project. This represents an addition to the previous grant of $170,000 awarded in 1969. The project is directed by Robert Samples and William Romey.

Environmental Studies (ES) represents a pioneer effort to develop materials for teachers that allow the student to express himself regarding the immediate environment in which he lives. It operates on two premises: (1) every student is in an environment and (2) the student can learn from this environment. A major distinction of this program is that three environments are considered: the inner environment of the child, the immediate environment in which he finds himself, and the global environment of so much concern to all mankind. Thus, rather than being merely an attempt to hop on the bandwagon of environmental concern, the ES program represents a major change in educational philosophy, approaching learning from the standpoint of the learner himself in his own environment.

In his book *Synectics* William Gordon of Harvard stated that the commonplace and immediate environment of a human being is the most difficult for that human being to study. The reason is simply that human mental processes tend to pattern the immediate environment into a form that is taken for granted. By doing this, we ignore the most immediate resource in the entire area of learning. Therefore, the job of Environmental Studies is to create instructional tactics and strategies enabling students to use this resource. Instead of asking a student to respond to a textbook abstraction of his environment, the program invites the student to invent the abstractions describing what he finds around himself. Thus, he becomes more capable and sensitive to his environment and develops a deeper understanding of the abstractions his heritage has provided. Richard Jones of Evergreen State College has stated that the immediate environment in which the student finds himself is probably richer in potential learning experiences for developing a deeper awareness of his self-worth than any kinds of abstract materials brought into the classroom.

Specific results of the testing program are being felt. Recently students at the Morgan Community School in Washington, D. C. assembled evidence about their environment. Certain unfavorable changes taking place in the block in which the school was located were recognized and amply photographed. A petition, drawn up by the students, was circulated and eventually presented to Washington's mayor. An appointment followed.

In Richmond, California, students mapped the school environment. With their maps as well as photographic evidence for change, they created a portrait of their present environment and compared it with what they predicted its condition would be in 1980. The bleak picture led them to devise strategies to counter the prevailing tendencies and to initiate a plan of action. In Los Angeles, California, as students photographed evidence for change, they noted a dirt hill on their high school campus made by excavators building a new high school next door. On top of the dirt pile they found intriguing cracks, leading them to conduct rather extensive stream table experiments with soil from the hillside to find out what conditions would create the cracks. Heat, pressure, and moisture were applied in varying circumstances to try to recreate the situations found outside. In Denver, Chicano students became concerned about their environment when they scooped muck from the edge of a nearby lake, dried parts of it, and had the solid materials and the water tested for chemical consistency. In Benjamin Franklin High School in Harlem, the teacher focused on student concern about whether or not heroin was polluting their environment.

Each area represented by Environmental Studies materials is separate, with no preferred sequence. The materials consist of colorful assignment cards which invite exploration and awareness of some aspect of the students' immediate physical, social, and/or inner environment. They also include suggestions for extensions into the same or related areas. Each of the cards is multi-disciplinary. The nature of the materials per-

Final Call

So far you probably have been a recipient of this publication by virtue of being on the mailing list for *Science Education News*. Now a separate list is being established, so if you wish to receive future issues, be sure to act now and advise the Editor, *Science for Society—Education Review*, 1515 Massachusetts Avenue, N.W., Washington, D.C. 20005.

mits their use as a supplement to existing courses of study or in a course by itself. The time allotments are wholly dependent upon the teachers and students using them. In addition, since the materials are designed for teachers, there is no grade level designation. In the test program, students ranged from first grade to graduate school.

The materials are invitations to involvement that denies identification of predetermined ends. It is this quality that creates the flexibility that makes these materials unique.

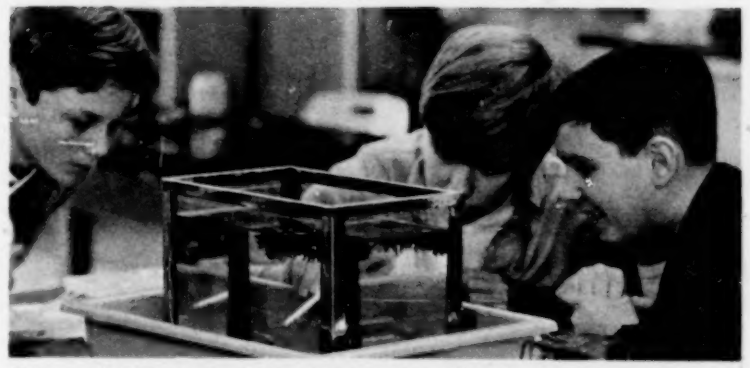
The materials are available at cost from Environmental Studies, P. O. Box 1559, Boulder, Colorado 80302.—Robert Samples.

The Intermediate Science Curriculum Study (ISCS)

Since 1966, the Intermediate Science Curriculum Study has been developing and testing a new science program aimed primarily at students in grades 7 through 9. A principal objective has been to give junior high school students the capacity to interpret their natural environment and to consider the consequences for that environment of man's effort to live the "good life." Therefore, early in the three-year sequence, we have developd activities designed to provide the student with a "tool kit" of concepts and skills basic to tackling the broad questions raised later on. The total three-year ISCS program offers one strategy for dealing with environmental science longitudinally across several grades.

The ISCS ninth-grade program (Level III) is that portion of the total three-year ISCS package most easily identified with environmental science. Among topics treated in the eight modules that make up that level are man's effect on environmental systems, the landscape of the United States and its origin, the science of weather, and the effects of extraneous substances on body health. Like all ISCS materials, the ninth grade modules are inquiry and activity centered. In each module the student explores a question or set of questions and tries to come up with answers based upon as much data as can be collected. Because of the nature of the topics included, it was not deemed possible, nor desirable, to eliminate subjectivity from these units. However, the student is urged to be alert as to when he uses subjective data to reach conclusions and when his conclusions are based upon objective evidence.

From an educational point of view, the environmental topics dealt with in ISCS ninth-grade units are among the most difficult that could have been chosen. It is extremely difficult to identify and isolate for study the relevant variables in problems dealt with in their naturalistic settings, and even harder to make appropriate measurements of those variables. Furthermore, even an elementary understanding of the complex phenomena of interest to the environmentalist requires



These ISCS students in Sarasota, Florida are preparing to use a goldfish in the study of thermal pollution.

some acquaintance with such sophisticated concepts as bio-degradability and energy flow. An important decision in the ISCS project was to provide, at an early stage, for considerable conceptual groundwork and practice in investigating natural phenomena. The purpose was to prepare the average junior high-school student to deal with such phenomena in their naturalistic setting at other than the descriptive level.

In Level I and Level II programs, designed to provide this experience, the student tackles fairly simple problems that involve fundamental principles with high transfer ability. Through this work we hope not only to build up the student's knowledge of basic science concepts but to develop his capacity to use key investigative skills as well. With this kind of background, the student entering the ninth grade program may be ready to think meaningfully and productively about the very complex, real problems confronting him there.

Distinctiveness of the ISCS program is not limited to the care with which the instructional sequence has been built. The way the program is used in the classroom is highly innovative. The materials for all three grade levels have been developed so as to permit introduction of an individualized form of instruction that allows students with different interests and abilities to travel at differential rates and through different content sequences. Slow working students and their faster classmates are not required to maintain the same pace. Furthermore, the program includes mechanisms for helping students with deficiencies in tool subjects like mathematics to increase their competency without holding back better prepared students, and for students to make departures to satisfy their special interests.[1]

The ISCS project has been underway since 1966 with financial support from the U.S. Office of Education and the NSF. Over the past five years, more than 300 scientists, teachers, science educators, school administrators, and psychologists have participated in the development of ISCS materials, and to date, more than 250,000 students have been exposed to them. More than 400,000 students in the 50 states and in Australia, Canada, Germany, Japan, and the Philippines are expected to use the materials during 1971-72. A group of Filipino writers is now preparing a specially adapted version of ISCS materials for use in their country; several other countries are contemplating similar action.

Commercial versions of the Levels I and II materials are currently available through Silver Burdett and Company, a division of General Learning Corporation. The Level III materials will be published by the same firm prior to the opening of the 1972-73 school year. The complete package for each level consists of student printed material, specially designed laboratory equipment, and teacher materials. ISCS is now at work on an individualized teacher training program through which school systems may acquaint their staffs with the ISCS program and the new instructional procedures built into it. The teacher education materials will not become generally available until field testing requiring at least one year is complete.—Ernest Burkham, Director, Intermediate Science Curriculum Study, Florida State University, Tallahassee, Florida 32304.

[1] For a more detailed description of these mechanisms, see Ernest Burkman, "ISCS: An Individualized Approach to Science Education," *The Science Teacher*, Volume 37, Number 9, December 1970.

The Science Curriculum Improvement Study (SCIS)

With our sudden and increasing interest in environmental education, we sometimes overlook some of the basic work done as a result of the support and the foresight of the National Science Foundation. Recognition of this is reflected in a report of the Environmental Study Group of the National Academy of Sciences—National Academy of Engineering[1] which said: "At the elementary level (K-6) the situation is somewhat brighter. There are at least three federally assisted programs of national importance, the major ones being Elementary Science Study (ESS), Science—A Process Approach (SAPA), and Science Curriculum Improvement Study (SCIS). Of these, SCIS is the most promising for environmental education, because it centers attention on ecological and biological questions. Also, it is unique in providing a variety of living organisms for classroom demonstrations and experiments as part of a complete elementary science course. The educational materials consist of textbooks, teachers' manuals, films, demonstrations, and experimental kits. At present the course is being taught to 200,000 children, and that figure is expected to rise to between 2 and 5 million within a few years. The project staff consists of approximately 30 persons, led by two scientists of national reputation and a young school administrator with a strong background in science. It is funded by NSF at about $600,000 per year; the total spent so far is approximately $4 million. The project is housed at the Lawrence Hall of Science, a Science Museum Teacher Training Center at the University of California in Berkeley.

"The project has been received favorably in U.S. schools and has been adopted by the Swedish government for use in Swedish public schools. It impresses us as an excellent beginning in environmental science for young children. The essential features that permitted success and that we believe must be present in new programs designed for the higher grades are: (1) Inspired leadership provided by one or more distinguished scientists; (2) Sustained adequate support; and (3) The appropriate academic environment for the project itself—working space, moral support, efficient management, and a vital intellectual community, plus teacher-training facilities."

The SCIS project was begun in 1962 by Dr. Robert Karplus, Professor of Theoretical Physics, University of California, Berkeley, in an effort to study how young children solve problems in science. Throughout its development the project has benefited from a wide range of talent in elementary schools, high-school innovative programs and college science and education departments.

Additional support for testing the experimental materials was found in the public schools of the five trial centers coordinated by leaders at Columbia University, Michigan State University, the University of Hawaii, the University of California at Los Angeles, and Oklahoma University.

The staff describes its own work[2] in part as follows: "The Science Curriculum Improvement Study is developing ungraded, sequential physical and life science programs for the elementary school-programs which in essence turn the classroom into a laboratory. Each unit is carefully evaluated by SCIS staff as it progresses from early exploratory stages to the published edition. The units originate as scientists' ideas for investigations that might challenge children and that illustrate key scientific concepts. The ideas are then adapted to fit the elementary school and the resulting units are used by teachers in regular classrooms. Thus they are tested several times in elementary schools before they are published. . . .

"The teaching strategy is for the children to explore selected science materials. They are encouraged to investigate, to discuss what they observe and to ask questions. The SCIS teacher has two functions: to be an observer who listens to the children and notices how well they are progressing in their investigations, and to be a guide who leads the children to see the relationship of their findings to the key concepts of science."

Roberts and Dyrli[3] recently observed that by supplementing the life science sequence of SCIS with a distinct social dimension, a strong recommendation can be made for designing a program of environmental education around the following laboratory-centered units: First Level—*Oganisms*, Second Level—*Life Cycles*, Third Level—*Populations*, Fourth Level—*Environments*, Fifth Level—*Communities*, Sixth Level—*Ecosystems*.

The happy marriage of the ideas of the physical sciences with those of the life sciences provide the added dimension of an interdisciplinary approach. The process oriented concepts of the physical science units are used by the children in solving problems posed in the life science units. Sometimes overlooked by environ-

These third grade children are adding crickets to a terrarium containing grass, mustard and pea plants in order to make observations while studying the SCIS Populations *unit.*

mental educators are the units: *Material Objects* (first level), *Interaction and Systems* (second level), *Subsystems and Variables,* (third level), *Relative Position and Motion* (fourth level), *Energy Sources* (fifth level), and *Models, Electric and Magnetic Interaction* (sixth level). The unit names may indicate the experiences children will have to produce the kinds of spin-offs needed not only to extend the SCIS ecology program but to provide input for other environmental programs.

Labinowich[4] calls attention to this feature of such a program: "Furthermore, given enough time to experiment with their bio-physical environment, children can gradually develop a belief in their own ability to change things and to control the outcomes of an event. Mary Budd Rowe of Columbia University has observed that young inner-city children interpret events in their life as a matter of fate; they are either lucky or unlucky. She places great faith in science education as a means of combating the inability of these children to act on their own behalf. . . . The SCIS also contributes to the development of a positive self concept which is essential to environmental problem solving—a goal of environmental education."

For more information about the SCIS Life Science Program write for a complimentary copy of "Ecology and Children" by Dr. Chester Lawson, to the address below. A Rand McNally representative in your area can furnish information about final editions of the SCIS units.—Jack Fishleder, Implementation Program Leader, Lawrence Hall of Science, University of California, Berkeley, California 94720.

[1] Environmental Study Group to Environmental Studies Board of the National Academy of Sciences-National Academy of Engineering, *Institutions for Effective Management of the Environment,* Washington, D. C. January 1970.

[2] Science Curriculum Improvement Study, *Newsletter,* No. 20, Lawrence Hall of Science, University of California, Berkeley, Spring 1971.

[3] Roberts, Arthur D. and Dyrli, Odvard E. "Environmental Education," *The Clearing House,* Vol. 45, No. 8, April 1971.

[4] Labinowich, Ed. "A Closer Look at Environmental Education" *Science and Children,* Vol. 8, March 1971.

The Institute for Environmental Education

Once again, students and teachers from all over the country have been swarming into woods and streams, downtown areas of cities, and lake and shore fronts, developing activities in analysis of water pollution, air and noise pollution, and the economic aspects of the environmental crisis. Personnel of the newly formed Institute for Environmental Education, successor to the Tilton Water Pollution Program, led three teacher and student training conferences this summer; one at Quincy Central Junior High School, Quincy, Mass., under leadership of Ray Whitehouse; another at the George School in Newton, Pa., under leadership of Alan Sexton and John Hershey; and a third at the University School in Cleveland, Ohio. The Cleveland conference was led by many of the staff for the first two gatherings, held concurrently just before the Cleveland one. The aim of the Quincy and Philadelphia conferences was to replicate past experiences, using as trainers the teachers and students who were trainees in the water pollution programs at Tilton School the previous two summers, and involving as participants students and teachers in the local school communities. The aim of the Cleveland program was both to replicate past experiences in terms of water pollution activities, and to develop new activities and analytic procedures in air and noise pollution, and in the social and political aspects of the environmental problem.

Excitement ran high at all three conferences. Students and teachers, working together as colleagues on problems that affected them and their society, learned the techniques for analyzing environmental problems. Most time was spent in either the field or the lab. The only time people were in the classroom was when they were sharing their data and trying to develop ideas about the problems they had identified. Even though the programs this year, unlike past years, were primarily commuter programs involving local people who lived at home and commuted to the school each day, participants often took lab kits home and continued tests at night, or met at six in the morning to catch an early high tide, or stayed late at night to take a water sample after dark. The student-teacher teams then spent much time planning implementation of a program in environmental education in their school in the fall.

The difficulties in carrying out such a program in schools are not easily dismissed. Getting the students out of the classroom and school building just once can be a problem, for example, let alone obtaining permission for students to go out on a regular basis to sample the water or air. Nevertheless, participants eagerly discussed their plans, and ways in which they were going to involve large numbers of their school personnel, both students and teachers, not only in assessment of a particular problem, but in writing up new activities and procedures to add to those already included in the publication "A Curriculum Activities Guide to Water Pollution and Environmental Studies." Issued in two vol-

umes and in draft form, the Guide was written by participants in the past two summer conferences. It is now available from the Institute for Environmental Education, 2803 Scarborough, Cleveland, Ohio 44118, at $15 postpaid.

A most important goal in the Institute's conferences is to train teachers and students in writing up their own activities and procedures, both for their own use and for use by others. A new mechanism to aid in reception and dissemination of such material was set up on a trial basis at the Cleveland conference. Called Telefeed, the system is basically a tape recorder at the end of a telephone line. Users of the program phone in their activities, in the prescribed format (worked out by the participants in the '70 programs and revised by subsequent participants) to the IEE office, where it is transcribed, edited, and sent out in monthly packets to program users. Preliminary trial runs indicate that the program works well; further tests are being performed to eliminate any "bugs" in the system.

First users of the Telefeed system will be participants in the IEE programs (and the predecessor Tilton programs). Sometime after the first of the year, however, use of the Telefeed system will be available to other interested schools and school systems on a subscription basis.

Perhaps the most gratifying aspect of the summer's programs, after the obvious involvement of students and teachers alike in this activity-oriented approach, was the depth and breadth of analyses of the environmental problem. Historically, the program started by focusing on water pollution; participants in the programs of all three summers soon found that this problem was connected to all other environmental problems and searched for a way to include them into the program. In this summer's Cleveland session, IEE had its mandate to deal with the broad aspects of the environmental problem and we were off and running! Two students, for example, developed a portable air pollutant detector, run by a small battery-powered pump, that costs less than $5.00. This can be hung in a location for 24 hours at a time, pulling air through an indicator, so that pollutant levels can be checked daily. One group, composed of both students and teachers, developed a series of activities investigating the economic aspects of pollution that take the investigator (be he student or teacher, or the entire class) deep into the problem.

The Institute for Environmental Education has many exciting plans for the future. In addition to running additional teacher and student training conferences next summer, the Institute will work with school groups and school systems in running one, two, and three-day introductory in-service workshops. Since it is the major goal of IEE to model problem-solving educational experiences, IEE will work with these school systems to develop on-going programs in problem-solving environmental education.

Perhaps the most telling comment of all, and the one that says most about IEE's philosophy, came in a general discussion about halfway through the program in Cleveland. A teacher-participant said, "I can't tell the students from the teachers here. *Now* I would like to hear from some of the students about this." This comment came just after three students had spoken.—Alan McGowan. Center for the Biology of Natural Systems, Washington University, St. Louis, Missouri 63130.

Views and Action on the Social Studies Front

Environmental education involves many disciplines, with those in the social studies field playing a prominent role. The authors of this article are recognized for their philosophy and their work in the area. Alan Levy is a founder of the Group for Environmental Education and a member of the architectural firm of Murphy, Levy, and Wurman in Philadelphia. Eliot Levinson is a member of GEE!, a teacher and a former aide to the Chancellor of the New York City School System. He is now a doctoral student at Stanford University's School of Education.—Editor's Note.

One day after a social studies class where he had been building models for future cities, Mark, one of the kids in the class, came up to us. Mark was fourteen and fatherless; he lived in a rough part of town and he couldn't read. Yet he held down various jobs as a messenger boy at a TV studio and successfully hustled numbers and crap games on the side. On this particular day he was bragging: "A rich friend of mine wants me to move in with his family in one of those fat towns." "That's great, Mark!" Our response was immediately positive. But Mark wasn't so sure: "That town's pretty and it's got lots of grass but it ain't got no action, and ya know I need lots of action. What do I do in a dumb town like that?"

Mark sets out the problem that environmental education should be working with: How does a person gain control over his environment? The answer isn't piecemeal. The answer isn't a matter of looking only at the psychological viewpoint which is shaped by that setting. But it is the *totality* that comes out of these three factors. Mark's answers aren't in information and value-laden books and films. He may find them in activities which connect his experiences and needs and concerns with useful skills and knowledge about how one makes tradeoffs, choices, transitions, and judgments.

From the beginning, environmental education must be seen as an *integrative* program which begins with the participant's own knowledge and experience of what's all around, what that person can smell, touch, feel and observe, and then proceed to judgments on the environment and a consideration of alternative possibilities.

With a holistic, real-world approach as the criteria, the development of materials and programs and curriculum must look to the broadest spectrum of disciplines and cognitive and affective processes. The job of materials in environmental education is to move us from the inside, out. Materials must begin with the constraints of current school organization—subject-matter or discipline-based learning and teacher-directed activities—and move people to a mastery of processes which they can apply as they cope with their environment.

At present all school materials on environment fall into either science, art or social studies. Although this is a starting point, we must move from the fragmented subject matter to open-ended problems and an arrangement of experiences that will make it possible for students to cope with day to day problems such as those confronting Mark. This goal will be realized only if the materials demand of students an integration of their perceptions and resources and involve them in processes that create options for ways of solving problems, or acting.

"Our Man-Made Environment" and other materials prepared by the Group for Environmental Education in Philadelphia offer a case in point for curriculum developers. Although these materials deal primarily with problems posed by the physical environment, the activities demand that the participant connect his physical or visual perceptions with those in the personal and psychological realms. The programs are the work of a collaborative of architects and educators which has worked steadily toward the goal of making students aware of their environment, giving them the confidence to make judgments about what they liked and didn't and providing them with a sense of aspiration for what might be.

Work on this curriculum began at the end of 1969 when some educators joined with the Philadelphia chapter of the American Institute of Architects to sponsor a program on the man-made environment. In 1969, the collaborators formed GEE!, the Group for Environmental Education, a non-profit corporation directed toward the original goals but with increased experience, talent and educational support. Financial support has come from the Philadelphia school system, the American Institute of Architects (both local and national), the Fels Foundation, the Heinz Foundation and most recently from Educational Facilities Laboratories Inc. and the Office of Environmental Education in Washington. The program has reached national and some international proportions; members have worked in support of and in collaboration with many teachers, schools and groups in setting up programs, training teachers, and developing materials and curricula.

To date the group's best known product has been the workbook entitled "Our Man-Made Environment." The book, 35,000 copies of which have been distributed, is meant to serve not as a self-sufficient educational program but rather as an introductory point of departure and as a device for structuring discussions and activities of teachers and students immersed in their own familiar environments. The format of the book is built around four broad questions—What is the man-made environment? Why do we build it? What determines its form? and How do we change it? Employing exercises and problems with some cut-outs, the student works out some of the answers by bringing into play his own experience, judgment, and creative instincts. But most of the answers are left for the class to find on their own, beyond the limits of the book.

In collaboration with the Philadelphia schools and the Pennsylvania Advancement School, the Group is presently completing three student workbooks on Mapping, Housing, and an Introduction to the Urban Environment, all originally written by a group of Philadelphia teachers. Other publications and programs are underway. A program on the "Process of Environmental Problem-Solving" is almost complete as is a "How To Do It" book on using the school as a tool for learning about the environment and a dissemination program in the form of a "correspondence workshop" for some 250 teachers. Papers on resources, teachers experiences and an approach toward classroom activities support all publications. The goal is to expand the Group's service to teachers and schools while developing new resource materials, always limiting the products to serve as "springboards" towards what must always be the main thrust of environmental education—environmental experience and involvement.

Still Other Approaches on Other Levels

The foregoing descriptions of environmental education activities are those of organizations offering programs and materials for use in school systems throughout the nation. Somewhat more localized yet adaptable by other groups having similar interests are programs of outstanding organizations like those headquartered in the San Diego County area and in Tennessee. The plans of the former, recently awarded a USOE grant, are generally outlined; the philosophy underlying the operations of the latter—from the standpoints of technology assessment and its implications for education and training—is given specialized treatment.

San Diego County Center for Environmental Education

In the San Diego area, many different groups have been working to develop better understanding and support of efforts to protect the environment. Each of these groups has made valuable contributions, but recently it became evident that their effectiveness could be greatly increased by coordinating the separate activities. Accordingly, an ad hoc committee was formed last year of representatives of business and industry, government, higher education, and the schools. A series of meetings resulted in the framing of a proposal for a

cooperative community project which was submitted to the U.S. Office of Education, HEW. On July 1, 1971, a USOE grant was awarded for the San Diego County Center for Environmental Education (CEE).

Working through the Center are 42 community agencies involved in one phase or another of environmental education; also the 50 school districts of the county. CEE activities are being managed by a representative steering committee with the help of a going concern—the Community Educational Resources section of the San Diego County Department of Education.

A first-phase undertaking of the CEE is an analytic inventory of the types of programs and activities currently being conducted, and the establishment of procedures for intercommunication and dissemination of information and materials among the participants. While students in the schools, K-12 and higher, are a prime target, education of the general public and of key figures in business, professional, and political life has high priority.

The principal purpose of the CEE is to develop and activate an overall environmental education plan for San Diego County. People from all the agencies are being brought together to map out coordination of activities through workshops, seminars, and conferences. A brief listing of some current activities of the participants indicates the range of regional resources to be woven into a unified pattern:

Scripps Institution of Oceanography: educational tours through their aquarium museum; seminars by research scientists for curriculum specialists;

San Diego Zoo: educational programs in the Balboa Park Zoo and soon-to-be-completed wild animal park in San Pasqual for endangered species from all parts of the world;

U.S. Navy: presentations of new techniques and facilities for deducing pollution from ships and base facilities;

Sierra Club: sponsorship of an ecology seminar in which teachers will receive guidance in using their immediate surroundings for environmental lessons;

State and local governments, and U.S. Navy: cooperation in establishing a 27-acre tidelands sanctuary for school children to study birds and other inhabitants of the estuarian environment;

Sea World: in cooperation with Community Educational Resources provides educational tours of aquatic displays, including manipulative experiences in artificial tidepools;

Coca Cola Bottling Company of San Diego: planning a seminar for teachers to demonstrate recycling of materials in industry.

These and the many other environmental education activities in the area contribute to the development and implementation of curricula at all levels. Community Educational Resources, with 12 years experience in producing multimedia curriculum materials derived from local sources, will receive materials developed by the CEE and process, adapt, produce, and disseminate them in modular form for use in all school districts. Included will be courses of study and units developed by the school districts themselves so that through sharing of output most efficient use can be made of talents and energy.

Simultaneously with creation of the CEE was the Ford Foundation award of a $725,000 grant to the County of San Diego to gather objective data on the County's environmental condition, and to make the data available to decision-makers within the region. The grant will be administered by the Environmental Developmental Agency, one of the 42 agencies of the CEE. The goal of the Ford Foundation grant is "To aid in creating a better environment for the San Diego region by helping the people of the county in making sound decisions on land use and other matters involving growth and development."—John Gessel, Director, Community Educational Resources, Center for Environmental Education, Department of Education, San Diego County, 6401 Linda Vista Road, San Diego, California 92111.

Oakridge (Tenn.) Science Education Center

Highly specialized information is an important input for environmental problem solving, yet the public and policy makers need and must receive information at a broader level of generalization than that required by experts. It is especially important for the public to have an understanding of the alternatives available for resolving complex environmental problems. To provide the public with knowledge of these options requires both educational and informational activity.

The Cooperative Science Education Center, established in 1968, in a subcontract with the Oak Ridge National Laboratory-National Science Foundation environmental program, has designed, developed, and implemented a series of educational and informational programs. The work of the CSEC is essentially directed at (1) developing and maintaining a relevant communication link between the scientist and technologist and a cross section of society, and (2) providing of environmental education and training services for those involved in the broad spectrum of educational programs.

There are two major program components, each consisting of five parts. The informational services component is designed to fulfill the public need for accurate and synthesized information required to clarify the issues.

Activities associated with the education and training effort make use of material from the ORNL environmental assessment program. In addition, they involve many of the lay public in activities which focus attention on the effective use of technology in understanding and resolving certain environmental problems.

The combination of the informational and educational activities is providing (1) useful environmental information to the public, (2) training to assist educators in preparing pupils to use sound scientific methods to evaluate complex environmental problems, and (3) a direct communication channel for the scientist to become aware of public concerns relevant to environmental problem assessment.

Selected examples of work in progress are:

1. *Environmental Information Service via WATS*—The program provides a rich resource for non-technical environmental information to anyone in Tennessee via an inward WATS line. The prime information storage, search and retrieval is made possible through use of an extensive encoded microfilm collection integrated with a high speed search device. Demands for non-technical information average 12 requests per day.

2. *The Center Bulletin*—The first issue of this bulletin, issued in July, represents a merging of two publications, the *CSEC Capsule* and the *CISE Output*. The former provided a forum for the ORNL research scientist to describe his work as it related to environment and technological assessment, and to do so in terms understandable to the lay public, especially teachers. It not only served as a communication medium from ORNL to the teachers, but also encouraged a feedback of useful information to the scientist. *The CISE Output* was the publication of the Center for In-Service Education whose major activity has been in assisting with inservice planning and activities for a 13-county region; also aiding in production of many educational TV films and in establishing a staff development program for Farragut schools in Knox County.

3. *Enviro County Workshops*—The CSEC has designed, developed, and applied a simulation problem for use in the training of teachers and decision makers concerning the inter-relatedness of all environmental problems and the role of environmental assessment. This large, three-dimensional unit has met with marked success in accomplishing its objective of introducing teachers and others to the socio-political, economic, and natural environmental factors that must be considered in the resolution of seemingly simple problems.

4. *Monitoring Projects for Public Attitude and Understanding*—As an integral part of every program, all participants have been surveyed to determine their present state of understanding as it related to environmental problems. This monitoring of all commentary, questions, and related discussion is providing a qualitative benchmark of teacher, pupil, and parent attitudes and understanding of the environment. This information has been analyzed, synthesized, and recycled to appropriate ORNL staff. It is also used in communication program design and development.

5. *Project VAMP—Volunteer Air Monitoring Project*—This is a state-wide air quality monitoring project, involving over 5,000 pupils and teachers and centered around placement of some 25,000 sedimentation foils. These were distributed throughout every county and city in Tennessee. The primary objective was to demonstrate how the individual can become involved in understanding and resolving real environmental problems such as particulate air pollution. Detailed reports, including local data, are being fed back to all participants and other interested agencies.—Peter H. Cohan, Executive Director, Cooperative Science Education Center, Inc., 156 Adams Lane, Oak Ridge, Tennessee 37830.

Commission-sponsored Consortium

The AAAS Commission on Science Education announces establishment of a consortium of community-sponsored environmental education councils to encourage local groups to work together toward achievement of common goals, to improve the environment of the community and environmental education within the community, to enhance the prestige and the influence of local groups, and to strengthen the Commission's program on science and society.

Charter members of the consortium, representing a nation-wide cooperative effort of independent agencies, are eight in number and include the San Diego County Center for Environmental Education and the Oak Ridge (Tenn.) Science Education Center, Inc., both described in this issue, plus six other outstanding organizations whose programs are summarized below.

Plans call for exchange of reports on activities at least twice a year, staging of at least one conference annually either at Commission headquarters or at the headquarters of one of the affiliated organizations (the first conference is planned for this fall), and a visit to one or two affiliated organizations each year.

Although the membership will be limited during the consortium's initial stages, leaders of groups who wish to explore the possibilities of becoming affiliated are invited to write to Dr. John R. Mayor, Director of Education, AAAS. Details about the six member organizations not described thus far are found on the next page.

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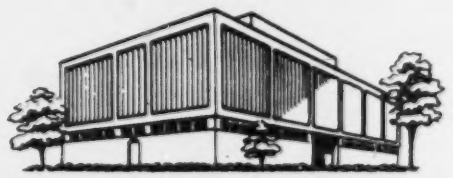

AAAS Commission on Science Education

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The New Jersey State Council for Environmental Education, with Edward J. Ambry as Director, and Mountain Lakes 07046 as its headquarters, has established a master state plan, the first in the nation. In order to achieve its primary objective—rapid, efficient creation of an environmentally literate citizenry—a 20-member Technical Advisory Committee appointed by the Commissioner of Education and representing a cross-section of all vital segments of the population, devised the master plan and proposed an Environmental Education Act, signed by the Governor August 4, 1971. Under it, the Commissioner of Education is authorized to promote establishment and operation of local public and private elementary and secondary school environmental programs. Funding includes $100,000 from the state for matching purposes, $452,600 in federal money and $170,000 in state Title III funds.

The Cleveland Museum of Natural History, with William E. Scheele as Director, and located on Wade Oval, University Circle, Cleveland, Ohio 44106, aims to maintain a public museum of natural history of the broadest possible scope, to educate at all levels, and to conduct basic scientific research. The museum's present buildings were opened in 1958, but even before that, a department of education, one of the first of its kind in the country, was established. A planetarium, display galleries, four sanctuaries totalling more than 1,000 acres, workshops, classrooms, research quarters, a living animal collection, a labelled nature trail in 12 woodland acres in the center of the city, a trailer museum, a distinguished speakers schedule, field trips throughout the United States—these are only representative features of an extensive program. A major expansion of the education department is currently under way. Without tax-based income, the museum's support comes from admissions, endowment income, foundation grants, gifts from individuals and business, and family membership ($25), the last outnumbering all other categories.

Fernbank Science Center, conceived and operated by the DeKalb County (Georgia) School System, is designed to foster appreciation of our natural heritage and the enhancement of scientific literacy. Through many creative educational programs based on current scientific frontiers, Fernbank has bridged the gap between the forefronts of scientific knowledge and more than 350,000 students (K through graduate school) and adults who visit the Center annually. The Science Center's teaching resources include a 500-seat Zeiss Mark V planetarium under a 70-foot diameter dome, a weather satellite tracking station equipped meteorological laboratory, an electron microscope laboratory, the largest observatory in the southeastern region (36-inch reflector), a nuclear science laboratory, a science reference library, and a spacious exhibit area. The Center also utilizes its 180 acres of natural areas as a "living laboratory" to increase insight and understanding in the natural sciences. Plans call for addition of a major museum, an inland marine aquarium, botanical gardens, and large greenhouse area.

The New Canaan Nature Center Association, Inc., with Melville C. Thomason as Director and with headquarters at 144 Oenoke Ridge, New Canaan, Conn. 06840, seeks to provide natural science, conservation, and horticulture education services for the youth of the area. Privately financed and now in its 11th year, the Association conducts programs in 41 categories, many involving local schools. Nine hundred members (nearly 20 per cent of the families resident in the community support the activities, and each year 300 people donate their services to carry the work forward. Besides two, full-time professionals, a director and a naturalist, the Association employs a secretary-bookkeeper, four part-time teachers, a part-time custodian, a curator of live animals, week-end hostesses, and special summer staff. The organization's 40 acres and outbuildings are owned by the Town of New Canaan which provides for maintenance and improvement of physical facilities.

The Northwest Environmental Education Center, with William J. Stocklin as Director, is located at Western Washington State College, Bellingham, Washington 98225. In July 1970, the National Center for Educational Research and Development (USOE) granted the Center $67,000, one of two such awards made that year, for developing and testing a pilot program at the regional level involving six counties. It is hoped that this investment, augmented by state funds, will result in a project whose format can be adapted by any school district in the country. With endorsement from the area's professional and business groups, as well as institutions of higher learning, the Center's goal is the inservice training of 15 to 20 percent of teachers within each district to function either as district, school or classroom specialists. The major teacher-training location is a 600-acre site on Whitbey Island in Puget Sound. With the program operational this fall, each district within the region should have a district specialist by June 1973, and 60 percent of the individual schools will be similarly served.

The Quality Environment Council of Nebraska and Western Iowa, with Larry C. Holcomb as Chairman, and with headquarters in Omaha (P.O. Box 7025, Zip: 68107) has as its purpose the conservation and improvement of the environment of the areas it serves by informing industry, government and the public of natural and environmental problems affecting human survival. Leaders in the scientific, academic and professional communities were instrumental in organizing the Council. Its policy-making Board of Directors includes naturalists, biologists, chemists, physicians, attorneys, engineers, agriculturists, homemakers, and businessmen. During the current year subcommittees are publishing reports and conducting speaking programs and environmental workshops on population, air pollution, water pollution, solid wastes, chemical pollution, consumer involvement, energy use, environmental education, and parks, open spaces and urban planning.

Big Ten and Chicago Team Up

The Committee on Institutional Cooperation—a voluntary consortium of the Big Ten universities and the University of Chicago—has established a high priority for cooperative efforts in environmental education, research, and public service. Currently, three CIC groups are active in these areas:

—The CIC Panel on Graduate Education in Biometeorology has operated for about eight years. In that time, it has coordinated the doctoral programs of dozens of students engaged in interdisciplinary curricula which can be grouped under the rubric "environmental studies," and supervised the training of hundreds of other students in field research methods. Now, with the diminution of Federal support for graduate training, the Biometeorology Panel is concerning itself with the retraining of unemployed aerospace technicians in the field of industrial health and safety.

—The CIC Environmental Action Panel, supported by a grant from the National Science Foundation, is undertaking planning in the areas of interinstitutional movement of students and faculty engaged in environmental studies, the establishment of environmental workshops for public policy makers, the structuring of special workshops for junior faculty charged with teaching environmental science to non-specialist undergraduates, the organization of environmental forums involving student action groups, an analysis of the role of American universities in the exportation abroad of U.S. environmental expertise, the introduction of new mechanisms to provide academic environmental consultation to government and industry, and the establishment of programs to retrain unemployed aerospace scientists and technicians as environmentalists.

—The CIC Greater Chicago Environmental Task Force, which includes representatives from a wide variety of disciplines in the life, physical, and social sciences at the University of Chicago, Northwestern University, the University of Illinois at Chicago Circle, Indiana University at Hammond, and Purdue-Calumet, is undertaking a series of educational, research and action programs in the southern Lake Michigan-Metropolitan Chicago area. The Task Force has been given initial support by the Illinois Institute for Environmental Quality pending Federal action on the Task Force's application for support. Initial activities of the Task Force include the compilation of an inventory of Chicago area research capabilities and a field research program to establish a data-base of environmental information in the environs of the new Zion, Illinois nuclear power plant.—Robin Wilson, Associate Director, Suite 970, 1603 Orrington Avenue, Evanston, Illinois 60201

Traveling Educational Exhibits

The National Center for Educational Communication, U.S. Office of Education, has developed ten self-contained, multi-media exhibits, describing ten innovative education programs and associated products. Now offered free to interested school systems and to educational and related professional organizations, the exhibits are based on work done at USOE-funded Regional Laboratories and R&D Centers. Each 10 ft. wide by 8 ft. high exhibit utilizes color films or sound-slide presentations along with other graphics and materials. Exhibit subjects and further details, as well as request forms for scheduling, should be addressed to George F. Staltz, Manager of Special Projects, Instructional Dynamics Incorporated, 166 East Superior Street, Chicago, Illinois 60611.

New Bibliography Issued

Publication of a comprehensive and up-to-date reference work on books, journals, articles, and other literature dealing with issues of science and society is announced by the Commission on Science Education of the American Association for the Advancement of Science. Primarily designed for use in physical science and social studies courses in high schools and colleges, but useful both to scientists and laymen increasingly concerned with the subject, the 96-page compendium is entitled *Science for Society: A Bibliography*. Almost 4,000 references, many annotated, are included. The publication constitutes a second and much expanded edition of a publication bearing the same title, issued by the Commission a year ago.

Support furnished by the National Science Foundation, E. I. du Pont de Nemours & Company, Xerox Corporation, and the AAAS itself makes it possible to offer the bibliography at the price of $1.00 per copy, or 75¢ each for ten or more copies. Orders, accompanied by payment, should be addressed to the Education Department, AAAS, 1515 Massachusetts Avenue, Washington, D. C. 20005.

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